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COMPARATIVE EVALUATION OF PERFORMANCE OF SNAILS *ARCHACHATINA MARGINATA* FED MILK LEAFEUPHORBIA HETEROPHYLLA AS AGAINST PAWPAW LEAFCARICA PAPAYA AND CONCENTRATE AS SOLE FEED

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ABSTRACT

The cost of procuring meat as an animal protein source in Nigeria is on the increase. There is therefore the need to source for alternative cheap source of animal protein. Snails are herbivores that can utilize plants as feed. An investigation was therefore conducted to determine the performance of snails on plants as against concentrates that are very expensive. 54 Snails were divided into three treatment groups comprising milk leaf (ML), pawpaw leaf (PL) and concentrate (C). There were three replicates with six snails per replicate in a completely randomized design. The feeding trial lasted 10 weeks. The result of proximate analysis showed that crude protein of ML was 33.7%, PL29.3% and C 46.3%. There were no significant differences between the weight gains of snails on ML and C which were significantly higher than those on PL ($P<0.05$). Snails on ML were also better converter of feed consumed with a feed conversion ratio of 1.95 compared with the values for snails on C (2.29) and PL (3.2). It can be concluded that that the performance of snails on ML was the best and can be recommended to snail farmers in order to increase the animal protein supply in Nigeria at a cheaper cost.

KEYWORDS: *Archachatina marginata*snails, Milk Leaf, Pawpaw Leaf, Weight Gain, Feed Conversion Ratio

INTRODUCTION

African giant land snails (*Archachatina marginata)* are invertebrates that have a soft body and a covering of hard shell. It is one of the micro livestock that has recently attracted attention among agriculturists in Nigeria as an aftermath of alarm raised by Food and Agricultural Organization (FAO) on animal protein deficiency among Nigerians (Adesope, 2000; Akinnusi, 2000). It has small body size and is easy to handle and manage. It is found in cool environment, in gardens, vegetable plantation, refuse heap, orchards, etc. There is therefore the need to increase animal protein production in Nigeria and other developing countries of the world as a panacea to imminent problem of malnutrition. Animal proteins are of better quality thanplant proteins due to their higher biological value. In particular, cereal proteins are low in lysine which is therefore called the limiting amino acid because it is the one most below human requirement. The plant protein of soya beans which is of good quality also has methionine as the limiting amino acid (Fox and Cameron, 1980). Nigeria is Africa's largest oil producer yet an appreciable number of her people are malnourished. A good percentage of the people still live beneath the poverty line and so cannot afford the costs of meat, egg, milk which are relatively higher than the cost of carbohydrate products like cassava, maize and pulses (Shaib *et al*., 1997).

Macro and micro livestock are sources of dietary animal protein. Macro livestock include big animals like cattle, pig, sheep, goat, chicken, etc. The cost of setting up and production of macro livestock is high and is already getting

beyond the reach of an average Nigerian farmer (Akinnusi, 1998). Micro livestock refers to a group of small animal species such as rabbits, cane rats (grass cutters), snails, quails etc. They are cheaper and excellent sources of animal protein (Akinnusi, 1998). Ajayi *et al.* (1978) pointed out that much of the shortfall in the protein intake in Nigeria could be met by revitalizing some of our wildlife species such as rodents, snails, antelopes and bush fowls.

African giant land snail (*Archachatina marginata)* is a high quality meat that is rich in protein, low in fat, a good source of iron and contains almost all the amino acids needed by human (Babalola, 2009, Fagbuaro, 2006, Omole 2003 andAwesu, 1980). Snail rearing is a relatively new area of animal production and research in Nigeria. For a very long time, snails were only obtained from the wild by women and children and sometimes men who goes to the forest during the raining season to gather them. The supply was initially assumed to be inexhaustible but in recent years, a visit to the roadside and market centres of snail supply areas leaves no one in doubt that wild snail population is on the decline. This may be due to human activities such as deforestation, bush burning, pesticide use and collection of immature snails by the gatherers. With this imminent problem of snails going into extinction coupled with unavailability all year round, snail farming became inevitable (Babalola and Akinsoyinu, 2010).

Snails are herbivores and will accept many types of feed including plant wastes. In intensive snail rearing, formulated feed containing all the needed nutrients for optimal growth are used for all year round production. This is not a profitable adventure since snails are slow growing animals and may not attain maturity less than a year and feeding them accounts for 70% of total cost of animal production. This necessitate the need to source for plant weeds that snails cherish and will make them grow optimally like formulated feed. Pawpaw leaf and fruit has for long been used in feeding domesticated snails but then there is competition between man and snails for pawpaw. Milk leaf or milkweed or Mexican fireplant, *Euphorbia heterophylla*, a ubiquitous weed was discovered to be highly relished by snails.

The weed originated from tropical and subtropical America but now occurs in Africa and Asia. In West Africa, it constitute serious problem because it can grow among many cultivations. The duration of its life is about 45 to 50 days and consequently, it can have many reproductive cycles per year (Kouakou et al, 2013). Milk leaf has been successfully used to feed Guinea pig but there is paucity of information on performance of snails fed milk leaf. This study was therefore conducted to evaluate the performance of *Archachatina marginata* snails fed milk leaf in comparison with pawpaw leaf and concentrate.

MATERIALS AND METHODS

Fifty four growing snails of mean weight 122.55±3.79 were randomly assigned to dietary treatments containing milk leaf (ML), pawpaw leaf (PL) and concentrate (C). Each treatment had 18 snails with 3 replicates and 6 snails per replicate in a completely randomized design. The snails were reared in wooden cages of 0.5x0.5x0.5m^3 compartments. Feed and water were given *ad libitum*. Egg shell powder was added to the soil weekly to supply calcium. Feed intake and weight gain were measured on a daily and weekly basis respectively. Other parameters determined were mortality and feed conversion ratio. The feeding trial lasted 10 weeks. Proximate composition of the experimental diets was carried out (AOAC, 1995). Parameters analysed were dry matter, crude protein, crude fibre, ash and ether extract. All data were subjected to analysis of variance while the treatment means were separated using Duncan multiple range test (SAS 1999).

RESULTS

Proximate Composition of Test Diets

The proximate composition of experimental diets is as shown on Table 1. The crude protein of the concentrate (46.3) was higher than that of the milk leaf and pawpaw leaf (33.7% and 29.3%) respectively. Crude fibre and ash followed the pattern: concentrate > pawpaw leaf > milk leaf (10.7, 8.3 &7.0 and 17.0, 12.0 &10.0) respectively. Concentrate had the highest ether extract content of 13.7%, milk leaf, 3% and pawpaw leaf, 0.9%. The moisture content of the diets followed this trend: pawpaw leaf > milk leaf > concentrate with the values of 25.5, 22.3 and 7.5 respectfully.

Table 1: Proximate Composition of the Snail Diets (% Dry Matter)

Nutrients	Pawpaw leaf (PL)	Milk leaf (ML)	Concentrate (C)
Moisture content	25.5	22.3	7.5
Crude protein	29.3	33.7	46.3
Crude fibre	8.3	7.0	10.7
Ether extract	0.9	3.0	13.5
Ash	12.0	10.0	17.0
Nitrogen free extract	24.0	24.0	5.0

Feeding and Growth Performance

The results obtained for the feeding and growth performance for growing *A. marginata* snails is as presented in Table 2. The mean dry matter feed intake showed that there were significant differences among the treatment means ($P<0.05$) (Figure 1). The highest mean weekly feed intake of 16.25g was recorded for snails on C, followed by those on PL (14.28g) while the lowest was recorded for those on ML (13.81g).

The weights gained by the experimental snails were affected by the dietary treatments ($P<0.05$). Snails on C recorded the highest mean weekly weight gain of 7.10g which was statistically similar to that of LW (7.07g) while those on PL recorded the least weekly weight gain of 4.57g (Figure 2). The best feed conversion ratio of 1.95 was obtained in snails on ML which was statistically different from those of snails on C (2.29) and PL (3.12) (Figure 3). Snails on PL and ML recorded mortality of 11.13% and 11.10% respectively while there was no mortality amongst those fed concentrate.

Table 2: Performance Characteristics of Snails Fed the Experimental Diets

Parameters	Pawpaw leaf (PL)	Milk leaf (ML)	Concentrate (C)	SEM
Weekly dry matter feed intake (g)	14.28^{b}	13.81^{c}	16.25^{a}	0.07
Initial weight (g)	117.90	122.57	127.18	
Final weight (g)	163.64^{b}	193.27^{a}	198.16^{a}	3.19
Weekly weight gain (g)	4.57^{b}	7.07^{a}	7.10^{a}	0.61
Total weight gain (g)	45.7^{b}	70.7^{a}	70.98^{a}	6.12
Feed conversion ratio	3.12^{a}	1.95^{c}	2.29^{b}	0.09
Mortality (%)	11.13	11.10	0	

a, b, c: means along the same row with different superscripts are significantly different ($p<0.05$)

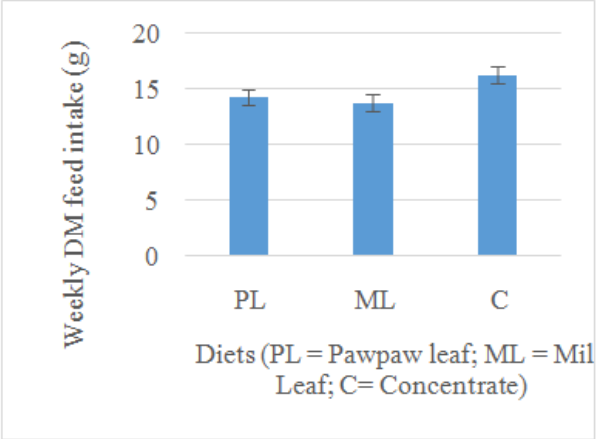

Figure 1: Weekly Dry Matter Feed Intake of Snails (g)

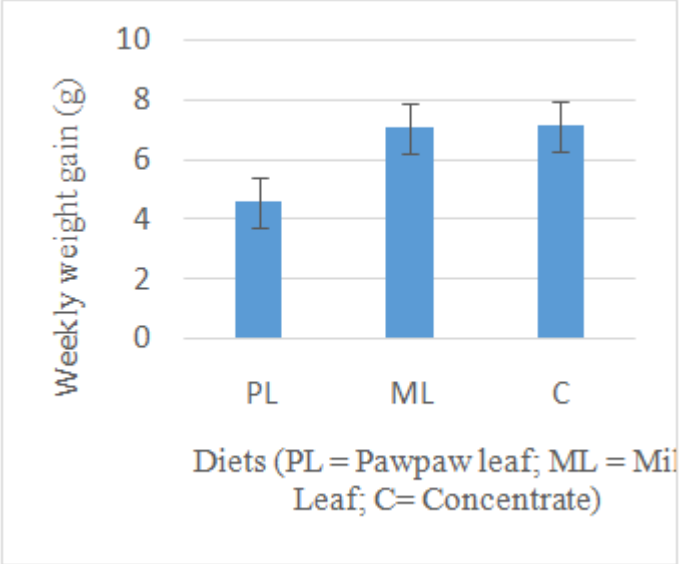

Figure 2: Mean Weekly Weight Gain of Snails (g)

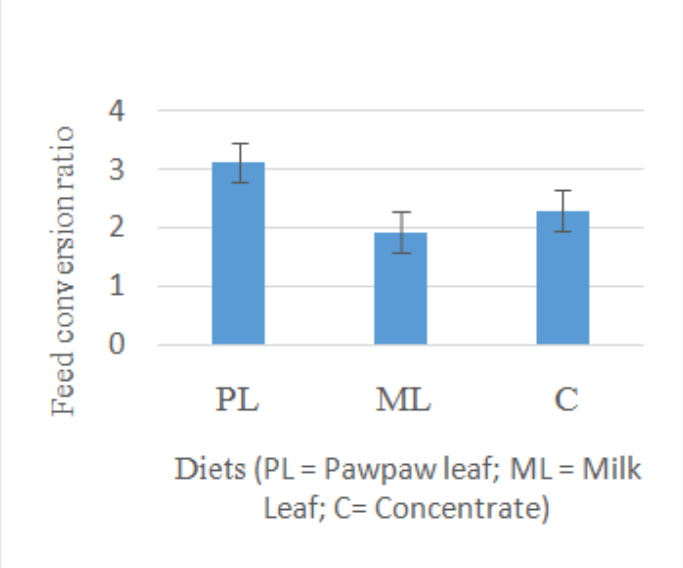

Figure 3: Feed Conversion Ratio of Snails

CONCLUSIONS

Archachatina marginata snails have been consumed for centuries but it was only recently that attempts were made to domesticate them. There is a dearth in the supply of quality feedstuffs for rearing them. Milk leaf (*Euphorbia heterophylla),* the weed of interest in this study was discovered to be highly relished by snails. There is paucity of information on the use of Milk leaf as snail feed. Milk leaf presents a good crude protein of 33.7% DM and fat content of 3%DM. Little wonder then that snails fed Milk leaf performed equally well as those fed concentrate. This compares well with Milk plant from the Democratic Republic of Congo as reported by Bindelle et al. (2007) who obtained Crude protein content of 16 to 27% DM and fat content of 7.7%DM. Bindelle et al. (2009) also concluded that its palatability, high availability and high digestibility makes Milk plant one of the most ingested plants by guinea pigs in Africa.

The low weight gained by snails on Pawpaw leaf when compared to other treatment groups may be as a result of some antinutrients present in the leaf which makes the nutrients unavailable to the snails. The mortality observed in snails on Milk leaf and Pawpaw leaf (11.1%) is low when compared with other conventional livestock. such as broiler, turkey, goat, sheep etc. (Stievnart, 1992; Akegbejo and Akinnusi, 2000; Amusan et al. 1998). Snails on Milk plant present the best feed conversion ratio, showing that the weed can be well converted into edible snail meat.

It can be concluded that milk plant can be utilized by *A. marginata* snails as cheap sole feed ingredient when compared with expensive concentrate, to boost animal protein supply in Nigeria.

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